

[54] **PERCUSSIVELY-IGNITABLE FLASHLAMP ASSEMBLY AND SELECTIVE FIRING MECHANISM THEREFOR**

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[52] U.S. Cl. **431/359; 431/361; 362/11**

[58] Field of Search **431/92, 93, 97; 240/1.3**

[56] **References Cited**

U.S. PATENT DOCUMENTS

3,735,111	5/1973	Shaffer	431/93
3,753,390	8/1973	Hough et al.	431/93
3,765,079	10/1973	Pfefferle et al.	431/93

3,980,421	9/1976	Heeman et al.	431/93
4,070,145	1/1978	Hall, Jr. et al.	431/93
4,076,488	2/1978	Hall, Jr.	431/93

Primary Examiner—Henry C. Yuen

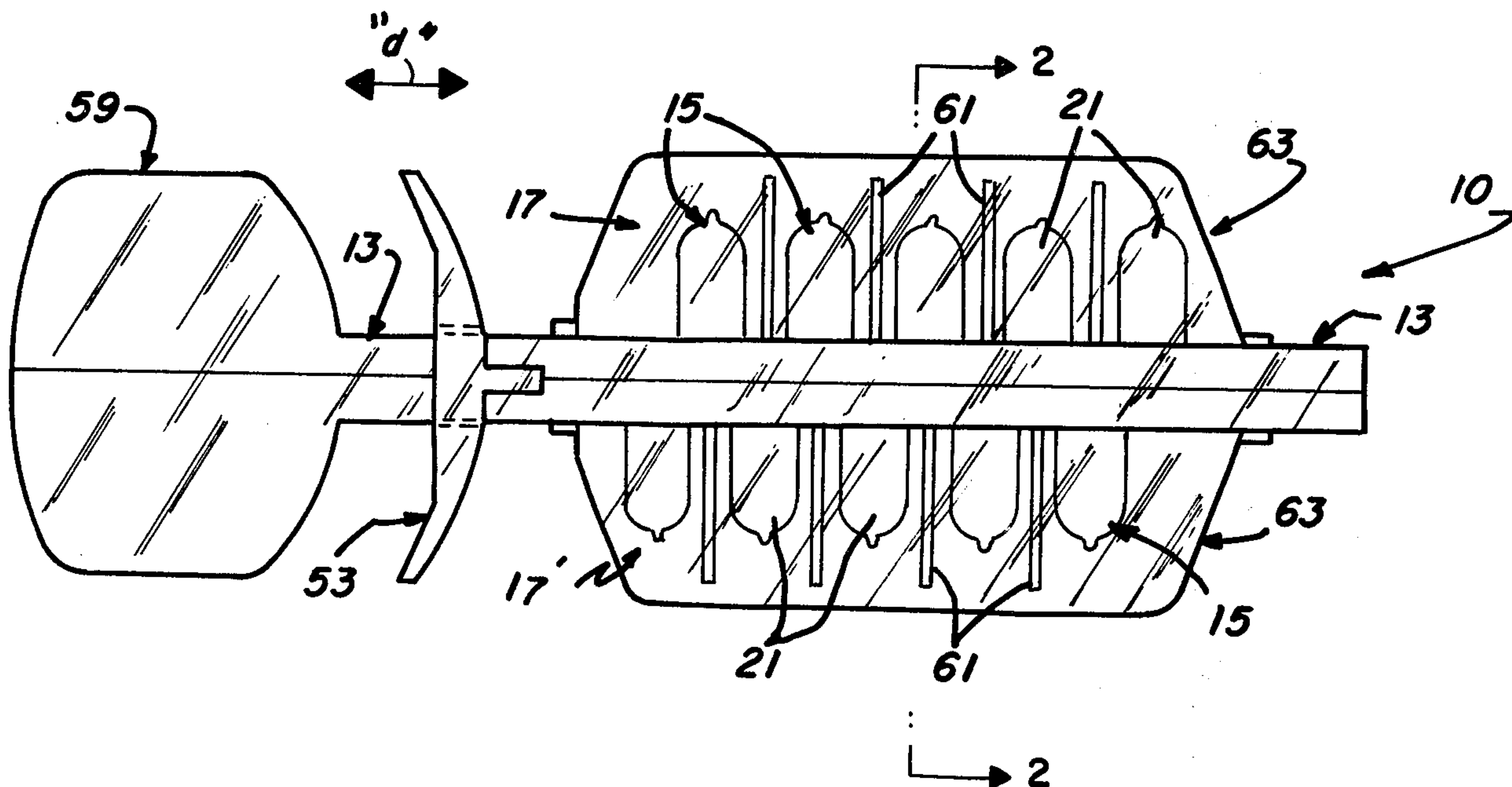
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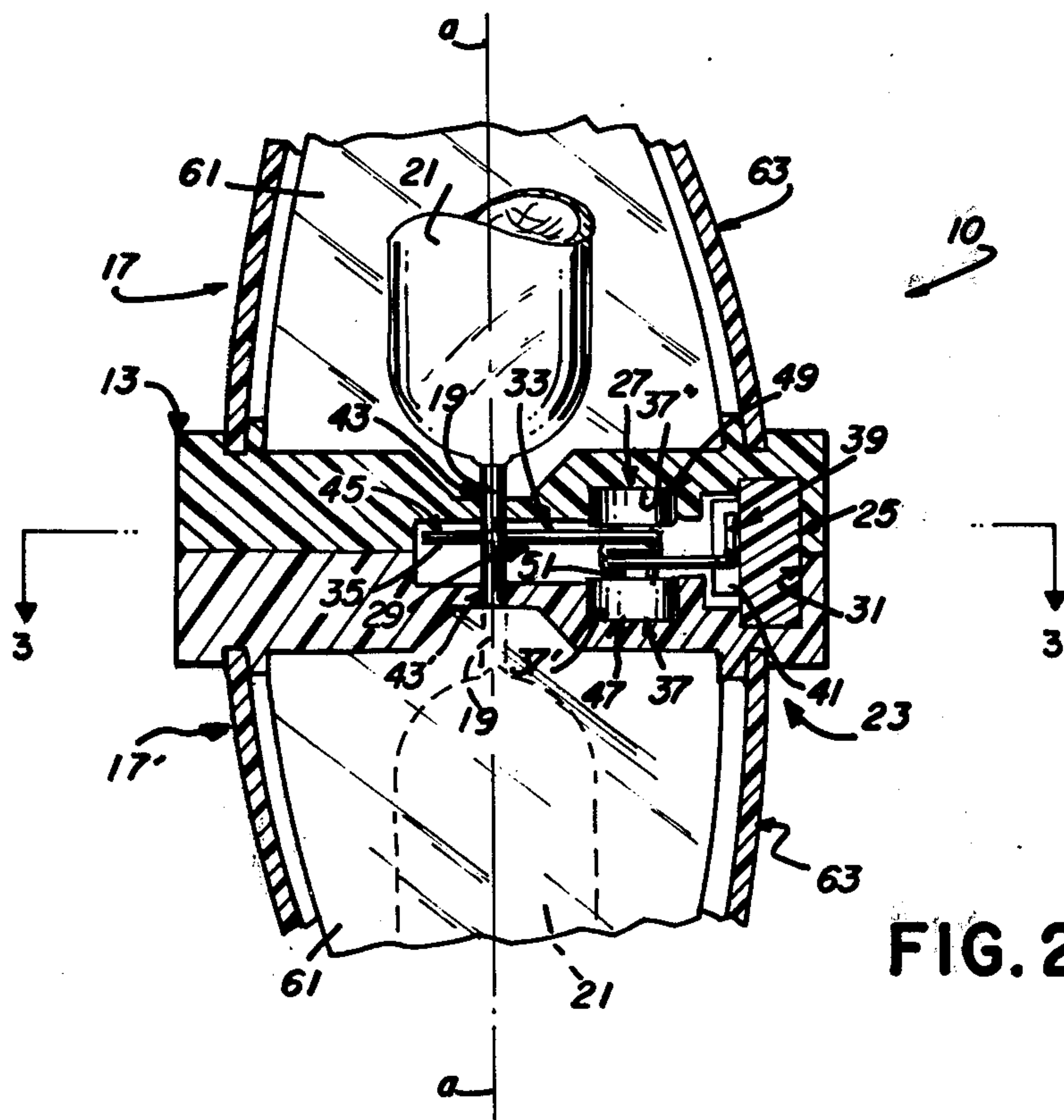
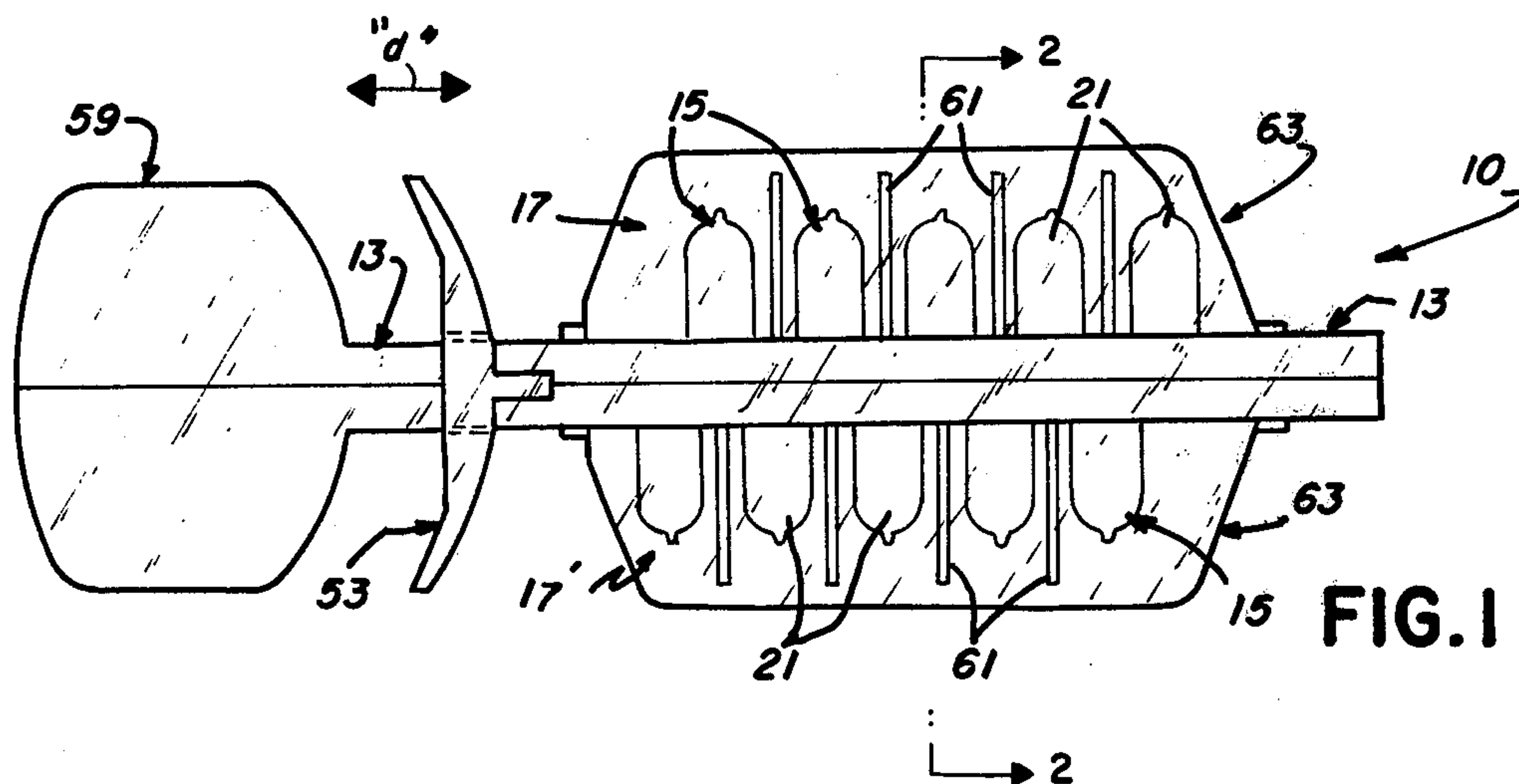
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ABSTRACT

A flashlamp assembly which utilizes a plurality of percussively-ignitable flashlamps disposed on an elongated support member. Firing of the flashlamps is accomplished using a spring-loaded ratchet, a movable carriage, and a striking mechanism, e.g. helical torsion spring, positioned on the movable carriage and in engagement with the ratchet. The spring engages and fires each of the lamps in response to the movement of the ratchet and carriage within the support member. A selective firing mechanism for the assembly is also disclosed.

18 Claims, 4 Drawing Figures





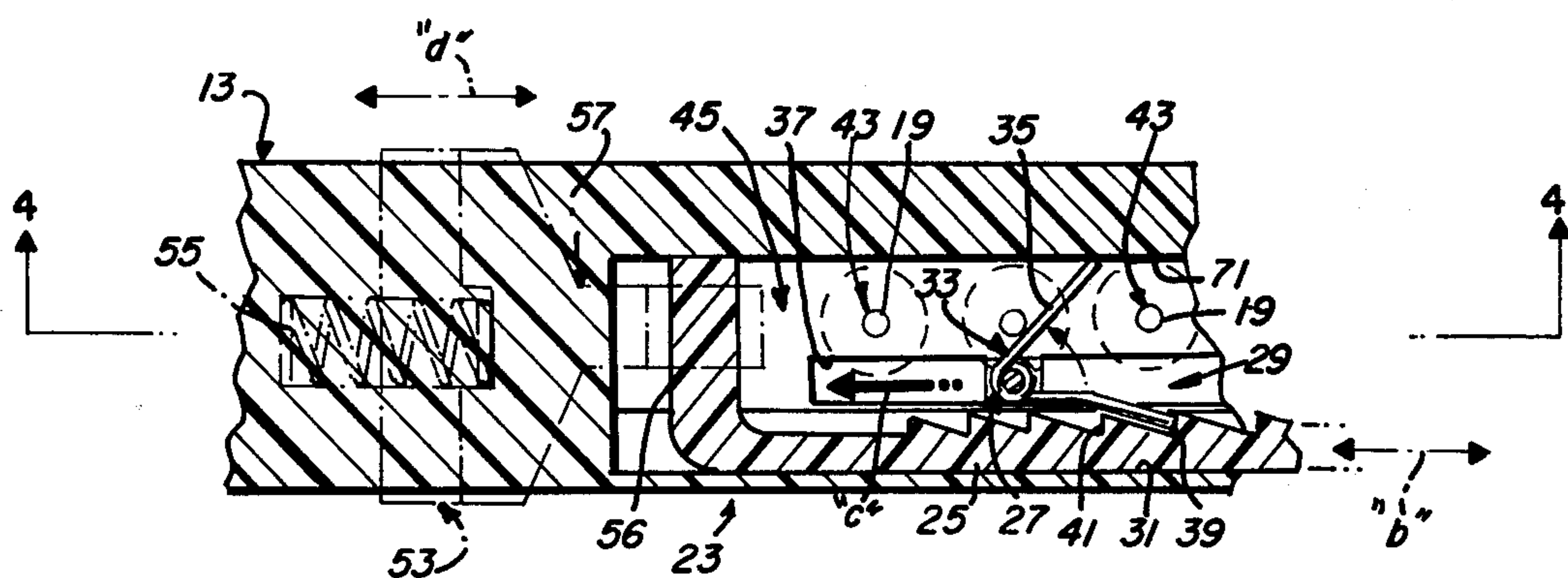


FIG. 3

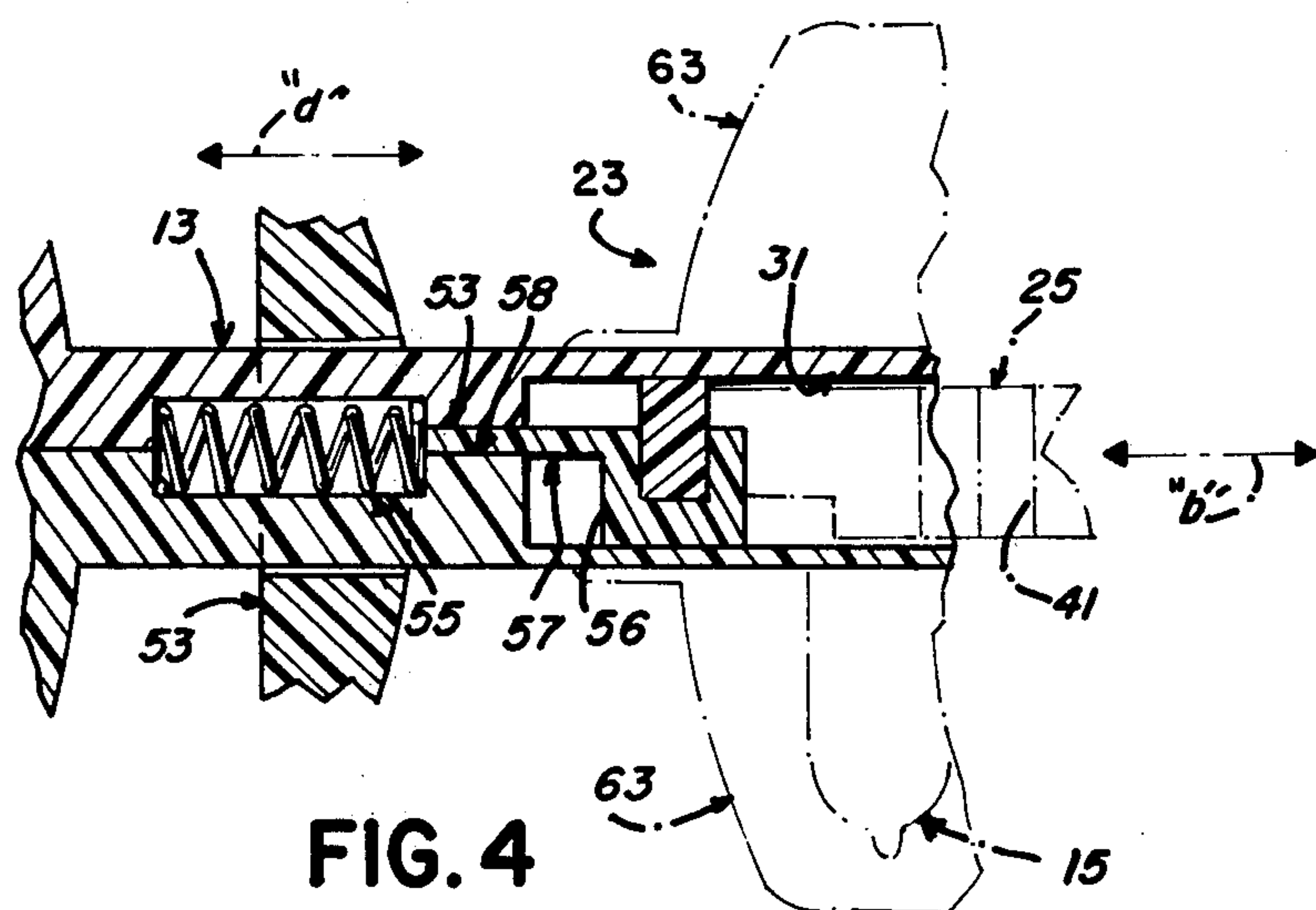


FIG. 4

PERCUSSIVELY-IGNITABLE FLASHLAMP ASSEMBLY AND SELECTIVE FIRING MECHANISM THEREFOR

CROSS REFERENCE TO COPENDING APPLICATIONS

Two applications, listed in the Patent and Trademark Office under Ser. Nos. 756,926 and 756,928 were filed Jan. 4, 1977. Ser. No. 756,926 describes a signal device which includes a plurality of percussively-ignitable flashlamps disposed on a support, a handle; and a trigger movably oriented between the flashlamps and the handle. Ser. No. 756,926 is an application for a design for a flashlamp assembly.

A previous application, Ser. No. 696,146 (H. H. Hall et al), filed June 14, 1976 and assigned to the same assignee as the present invention, defines a flashlamp assembly which employs a spring-loaded ratchet bar and a slidable member, e.g., helical torsion spring, which fires the assembly's flashlamps during movement of the ratchet bar. Ser. No. 696,146 is now U.S. Pat. No. 4,076,488.

Two additional applications filed June 14, 1976 were classified as Ser. Nos. 695,991 now U.S. Pat. No. 4,070,145 (H. H. Hall et al) and 696,107 now U.S. Pat. No. 4,055,759 (Bouchard et al) and are also assigned to the same assignee as the present invention. Both of these applications describe percussive flashlamp signal devices wherein each of the lamps has a preenergized striker, e.g. torsion spring, associated therewith. Ser. No. 696,107 and Ser. No. 695,991 are now U.S. Pat. Nos. 4,055,759 and 4,070,145, respectively.

BACKGROUND OF THE INVENTION

The present invention relates to flashlamp assemblies and more particularly to flashlamp assemblies which employ flashlamps of the percussively-ignitable variety. The invention further relates to selective firing mechanisms for use in the described assemblies. One particular embodiment of the invention is a signal device capable of being operated by hand.

The flashlamp assembly defined in the aforementioned U.S. Pat. No. 4,076,488 describes use of a helical torsion spring which operates in response to the reciprocal movement of a ratchet bar to selectively fire individual percussive flashlamps positioned on the assembly's supportive member. Similarly, the assembly of the instant invention also utilizes a ratchet bar and a striking mechanism which serves to selectively fire the percussive flashlamps in the assembly. One particularly advantageous feature of the present invention over the embodiments defined in U.S. Pat. No. 4,076,488 is the utilization of a slidable carriage member which moves within the assembly's support member and which has the desirable striking mechanism positioned thereon. Use of this carriage, which operates in the manner defined, substantially improves alignment of the striking mechanism during its movement through the assembly's support member, said alignment essential in order to assure proper firing of the flashlamps. Accordingly, use of the described carriage member in combination with the remaining components, e.g. ratchet member, striking mechanism, etc. significantly increases the reliability of a flashlamp assembly such as defined in U.S. Pat. No. 4,076,488.

It is believed therefore that a flashlamp assembly which employs a movable carriage member therein to

substantially improve the alignment of the assembly's striking mechanism during the mechanism's movement within the assembly would constitute an advancement in the flashlamp assembly art.

It is also believed that a flashlamp assembly selective striking mechanism which operates in a more facile and advantageous manner than known striking mechanisms would constitute an art advancement.

OBJECTS AND SUMMARY OF THE INVENTION

It is therefore a primary object of the instant invention to enhance the flashlamp assembly art.

It is another object of the invention to provide a flashlamp assembly which operates in a more reliable manner than known assemblies of the art.

It is still another object of the invention to provide a selective firing mechanism for a flashlamp assembly using percussively-ignitable flashlamps which improves the alignment of the assembly's striking mechanism during its movement within the assembly.

A further object of the invention is to provide a flashlamp assembly of the nature described wherein the assembly may be utilized as a hand operable signal device.

In accordance with one aspect of the present invention, there is provided a percussively-ignitable flashlamp assembly which comprises a support member defining a plurality of channels therein, a spring-loaded ratchet member movably oriented within one of the support's channels, and a striking mechanism which is in engageable contact with the ratchet and is capable of selectively firing the flashlamps. The assembly further comprises a slidable carriage member which moves within a second of the support's channels and has the described striking mechanism located thereon. Thus, the striking mechanism will fire the flashlamps in response to the movements of the ratchet and carriage member.

According to another aspect of the invention, there is provided a selective firing mechanism for a flashlamp assembly which includes a support member and a plurality of percussively-ignitable flashlamps positioned on the support. The mechanism comprises a spring-loaded ratchet, a resilient striking mechanism, and a movable carriage upon which the striking mechanism is positioned. During movement of the ratchet and carriage members within the longitudinal channels defined by the assembly's support member, the resilient striker selectively fires the respective flashlamps.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view of a flashlamp assembly in accordance with a preferred embodiment of the invention;

FIG. 2 is an end elevational view, partly in section, of the assembly of FIG. 1 as taken along the line 2—2 in FIG. 1;

FIG. 3 is a plan view, in section, as taken along the line 3—3 in FIG. 2; and

FIG. 4 is a side elevational view, in section, as taken along the line 4—4 in FIG. 3.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

For a better understanding of the present invention together with other and further objects, advantages, and capabilities thereof, reference is made to the follow-

ing disclosure and appended claims in connection with the above described drawings.

With reference to the drawings, there is shown a flashlamp assembly 10 which comprises an elongated support member 13 upon which are mounted a plurality of flashlamps 15. Each lamp 15 is of the percussively-ignitable variety similar to those defined in U.S. Pat. No. 3,535,063 (L. F. Anderson et al), said patent assigned to the same assignee as the present invention. As described therein, percussive flashlamps comprise a light-transmitting envelope and a projecting primer tube. Deformation of the tube results in deflagration of the lamp's fulminating material up through the tube and the subsequent ignition of the combustible filamentary material, e.g. zirconium foil, located within the envelope. This ignition process is often termed in the flashlamp industry as "firing" of the lamp.

The lamps 15 of the invention are preferably arranged on support 13 in two opposing and substantially parallel rows 17 and 17'. Accordingly, the lamps in row 17' are inverted with respect to those in row 17 and the respective primer tubes 19 project from envelopes 21 in opposing directions. This preferred positioning relationship is best illustrated in FIG. 2. It is further preferred that the lamps in row 17' be alternately positioned on support 13 with respect to the opposing lamps in row 17 and that the respective projecting primer tubes occupy a common place "a-a" as shown in FIG. 2.

Selective firing of flashlamps 15 is accomplished by the assembly's firing mechanism 23 (FIGS. 2-4) which comprises a spring-loaded ratchet member 25, a carriage member 27, and a resilient striking mechanism 29.

Ratchet 25 is slidably positioned within a first longitudinal channel 31 defined by support 13. Striking mechanism 29, preferably a helical torsion spring 33 having an extending striker arm 35 for selectively engaging and thus deforming each of the projecting primer tubes 19 of lamps 15, is located on carriage 27 and is thereby assured of proper alignment during movement through support 13.

As shown, carriage 27 is slidably positioned within a second longitudinal channel 37 defined within support 13 and which includes a first open or slotted portion 37' and a second open or slotted portion 37''. Engagement and deformation of primer tubes 19 is achieved by reciprocal movement (direction "b" in FIGS. 3,4) of ratchet 25 within first channel 31.

Spring 33, which also includes a leg portion 39 in engagement with the ratchet teeth 41 on ratchet 25, is thus forced to move laterally (direction "c" in FIG. 3) in response to this reciprocal movement as well as the resulting sliding movement of carriage 27 within channel 37. Striker arm 35 of spring 33 will thereby swing up and strike the primers 19 to cause deformation thereof. Continued movement in direction "c" causes the striker arm 35 to pass under the deformed primer and strike the next (adjoining) primer. It can therefore be seen that spring 33 does not move during the return movement (opposite direction "c") of ratchet 25 due to the engagement of a wall 71 by the end portion of arm 35 at the start of this movement and the ability of leg portion 39 to slide over the respective tooth on the ratchet. It can further be understood that each of the primer tubes 19 of a fired flashlamp serves to re-tension spring 33 prior to the next firing sequence.

It is therefore understood from the foregoing description that alignment of spring 33 during its movement through support 13 is critical to the operability of as-

sembly 10. Misalignment of the member can easily result in nonengagement of one or more primers 19 and subsequent nonfiring of the respective flashlamps. Accordingly, one of the primary features of the present invention is the provision of carriage 27 which serves to maintain this alignment.

Support 13 is shown in FIGS. 2 and 3 as containing a plurality of spaced openings 43 therein, each of which is adapted for accommodating a respective one of the primers 19 of lamps 15.

It is additionally preferred to provide a plurality of secondary openings 43' each in alignment with a respective opening 43 and spaced a predetermined distance therefrom. Accordingly, when each primer 19 is located within both of the openings 43 and 43', the respective spacing therebetween defines a third longitudinal channel 45 within support 13. It can be seen in FIG. 2 that striker arm 35 extends within channel 45 and is thus adapted for engaging the portion of primer tube 19 located therein. In the broader aspects of the invention, it is understood that channel 45 can be omitted and only singular opening 43 (or 43') provided to accommodate one of the primers. The arrangement shown in FIG. 2 is preferred, however, to provide a two-point, spaced retention on each primer 19 with the necessary striking engagement occurring therebetween. When utilizing the three longitudinal channels 31, 37, and 45, it is preferred that the three be positioned within support 13 in a substantially parallel relationship.

Carriage 27 is shown in FIG. 2 as comprising first and second opposing end portions 47 and 49 slidably oriented within open portions 37' and 37'', respectively, of second channel 37. Carriage 27 further comprises a central portion 51 located between ends 47 and 49 and adapted for having helical spring 33 positioned thereon. Orientation of both opposing ends 47 and 49 within channel 37 prevents tilting or similar misalignment during the carriage's lateral movement. In the preferred embodiment of the invention, end 47 of carriage 27 is of a boxlike configuration while end 49 and central portion 51 are substantially cylindrical in shape.

A preferred use for flashlamp assembly 10 is as a signal device capable of being operated by hand. As will be described, the device is adapted for single-handed operation and permits the operator to issue a signal or series of signals of relatively high intensity to indicate a condition of distress, warning, etc. When used as this device, assembly 10 preferably further includes a hand-operable trigger 53 movably oriented on and extending from elongated support 13. Trigger 53 is operatively joined to ratchet 25 by connecting arm 57 which forms a part of the trigger. Trigger 53 is also spring-biased within support 13 using spring 55. A slot 58 (FIG. 4) is provided in support 13 to accommodate arm 57. Spring 55 biases trigger 53 in a direction toward ratchet 25 to thus assure return of the trigger after actuation (displacement away from flashlamps 15) by the operator's hand. The direction for this displacement and biased return is indicated in FIGS. 1, 3, and 4 as directional arrows "d". Because trigger 53 and ratchet member 25 are operatively joined via connecting arm 57 and move in the manner indicated, it is understood that directions "b" and "d" are substantially parallel and further that spring 55 also serves to bias ratchet 25 (away from handle 59). In the event that a trigger as shown in the drawings is not utilized as part of assembly 10, spring-loading ratchet 25 could be accomplished with a minor modification to the support's structure to include spring

55 at a location suitable to position it directly against one of the surfaces, e.g. 56, of the ratchet.

If it is desired to use assembly 10 as a signal device, it is additionally preferred to provide the assembly with a handle 59 extending from support 13. Handle 59 is designed to fit snugly within the palm of an operator's hand and thus trigger 53 can be actuated by one or more of the operator's fingers. Handle 59 can be hollow to serve as a storage compartment for an indicating dye, said material particularly desired for marine applications. A hollow handle could also include styrofoam or similar material to add buoyancy to device 10.

Assembly 10 further preferably includes a plurality of light-shield partitions 61 located on support 13, each of these members positioned between a respective pair of flashlamps to eliminate sympathetic flashing of one lamp as a result of prior flashing of an adjoining lamp. Assembly 10 may also include a light-transmitting cover 63 securedly positioned on support 13 and adapted for covering lamps 15. In the embodiment shown in FIG. 1 wherein two opposing parallel rows of lamps are used, it is preferred to employ a cover 63 for each row. It is further preferred that each of the covers 63 be hermetically sealed to support 13, particularly if device 10 is to be utilized for marine use.

Support 13, handle 59, trigger 53, ratchet member 25, carriage 27, and partitions 61 are all preferably of a thermoplastic material. Covers 63 may be of transparent thermoplastic material while spring 33 may be of 0.029 inch dia. piano wire.

In addition to the above-described components, the signal device assembly may further include a sheet of reflecting material (not shown) along the interior of one of the side walls of covers 63. The reflecting surface of this sheet may be inserted so as to face the lamps and function as a reflector of visible light to enhance the signaling affect or as a mirror for daytime signaling purposes. The exterior surfaces of partitions 61 may also be made reflecting, such as by aluminizing, if desired. In addition to the reflector sheet insert, a filter sheet (not shown) such as a cellulose acetate color filter may be secured to the entire inside surface of the cover. This color filter, whether blue, yellow, orange, red or other color may serve to draw more attention to the device upon firing, and also function as a decorative feature.

Although the invention has been described with respect to specific embodiments, it will be appreciated that modifications and changes may be made by those skilled in the art without departing from the scope of the invention. For example, the dimensions and design of the helical torsion spring may be modified. In fact, in lieu of the helical torsion spring, other types of striking mechanisms with resilient striker means may be employed. The lamps may be aligned in a linear array on one side of the support member, rather than in the opposing array illustrated. The ratchet may be actuated by hand engageable means other than a biased trigger of the configuration shown. Further, although specifically illustrated as a signal device, it is readily contemplated that the described flashlamp assembly with selective firing mechanism may be adapted as a photoflash unit by the addition of suitable reflectors and provision of an appropriate linkage to a camera shutter release mechanism.

While there have been shown and described what are at present considered the preferred embodiments of the invention, it will be obvious to those skilled in the art that various changes and modifications may be made

therein without departing from the scope of the invention as defined by the appended claims.

What is claimed is:

1. A flashlamp assembly comprising:
an elongated support member defining a plurality of longitudinal channels therein;
a spring-loaded elongated ratchet member slidably positioned within a first of said longitudinal channels;
a carriage member slidably positioned within a second of said longitudinal channels;
a plurality of percussively-ignitable flashlamps mounted on said support member; and
a resilient striking mechanism positioned on said carriage member and in engageable contact with said elongated ratchet member for selectively firing said flashlamps by engagement therewith in response to sliding movement of said ratchet member and said carriage member within said first and second longitudinal channels, respectively.

2. The flashlamp assembly according to claim 1 wherein each of said flashlamps includes a light-transmitting envelope and a primer tube projecting therefrom, and said elongated support member contains a plurality of spaced openings therein each for accommodating a respective one of said primer tubes of said flashlamps, said striking mechanism selectively engaging each of said primer tubes to effect said firing of said flashlamps during said sliding movement of said ratchet and carriage members.

3. The flashlamp assembly according to claim 2 wherein said striking mechanism comprises a helical torsion spring having an extending striker arm for effecting said selective engagement of each of said primer tubes.

4. The flashlamp assembly according to claim 3 wherein said carriage member comprises a body including first and second opposing end portions slidably positioned within said second longitudinal channel and a central portion interconnecting said opposing end portions, said helical torsion spring positioned on said central portion.

5. The flashlamp assembly according to claim 3 wherein said primer tubes of said flashlamps extend within a third of said longitudinal channels within said support member, said striker arm of said helical torsion spring extending within said third longitudinal channel to effect said selective engagement.

6. The flashlamp assembly according to claim 5 wherein said first, second, and third longitudinal channels within said support member are substantially parallel.

7. The invention according to claim 2 wherein said flashlamp assembly is a hand-operable signal device.

8. The signal device according to claim 7 further including a hand-operable trigger movably oriented on and extending from said elongated support member, said trigger operatively joined to said spring-loaded ratchet member to effect said sliding movement of said ratchet member in response to hand actuation of said trigger.

9. The signal device according to claim 7 wherein said elongated support member includes a handle portion extending therefrom.

10. The signal device according to claim 7 further including a plurality of light-shield partitions positioned on said support member between respective pairs of said flashlamps, and a light-transmitting cover means

securedly positioned on said support member for substantially covering said flashlamps.

11. The signal device according to claim 7 wherein said flashlamps are mounted on said support member in two substantially parallel rows.

12. The signal device according to claim 11 wherein said two rows of said flashlamps are mounted on opposing sides of said support member with said primer tubes projecting from said envelopes of said flashlamps in opposing directions and in a common plane, said primer tubes of one row of said lamps alternately positioned within said common plane with respect to said primer tubes of the other of said rows of flashlamps.

13. A selective firing mechanism for a flashlamp assembly including an elongated support member defining a plurality of longitudinal channels therein and a plurality of percussively-ignitable flashlamps mounted on said support member, said selective firing mechanism comprising:

- a spring-loaded ratchet member slidably positioned within a first of said longitudinal channels within said support member;
- a carriage member slidably positioned within a second of said longitudinal channels; and
- a resilient striking mechanism positioned on said carriage and in engageable contact with said ratchet member for selectively firing said flashlamps by engagement therewith in response to sliding movement of said ratchet member and said carriage member in said first and second longitudinal channels respectively.

14. The firing mechanism according to claim 13 wherein each of said flashlamps includes a light-transmitting envelope and a primer tube projecting therefrom and said elongated support member contains a plurality of spaced openings therein each for accommodating a respective one of said primer tubes of said flashlamps, said resilient striking mechanism selectively engaging each of said primer tubes to effect said firing of said flashlamps during said sliding movement of said ratchet and carriage members.

15. The firing mechanism according to claim 14 wherein said striking mechanism comprises a helical torsion spring having an extending striker arm for effecting said selective engagement of each of said primer tubes.

16. The firing mechanism according to claim 15 wherein said carriage member comprises a body including first and second opposing end portions slidably positioned within said second longitudinal channel and a central portion interconnecting said opposing end portions, said helical torsion spring positioned on said central portion.

17. The firing mechanism according to claim 15 wherein said primer tubes of said flashlamps extend within a third of said longitudinal channels within said support member, said striker arm of said helical torsion spring extending within said third longitudinal channel to effect said selective engagement.

18. The firing mechanism according to claim 17 wherein said first, second, and third longitudinal channels within said support member are substantially parallel.

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